

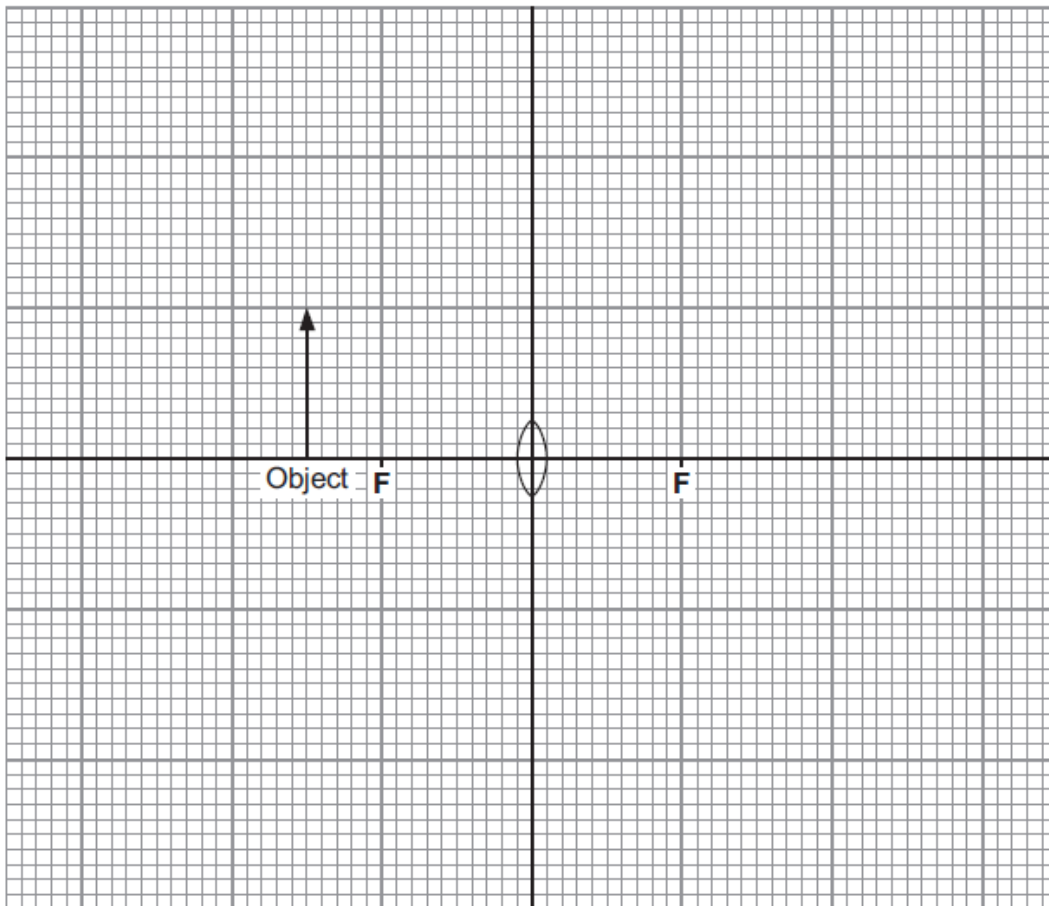
Lenses

1.

A student investigated how the nature of the image depends on the position of the object in front of a large converging lens.

The diagram shows one position for the object.

(a) Use a ruler to complete a ray diagram to show how the image of the object is formed.



Key: F = principal focus

(4 marks)

(b) Describe the nature of this image relative to the object.

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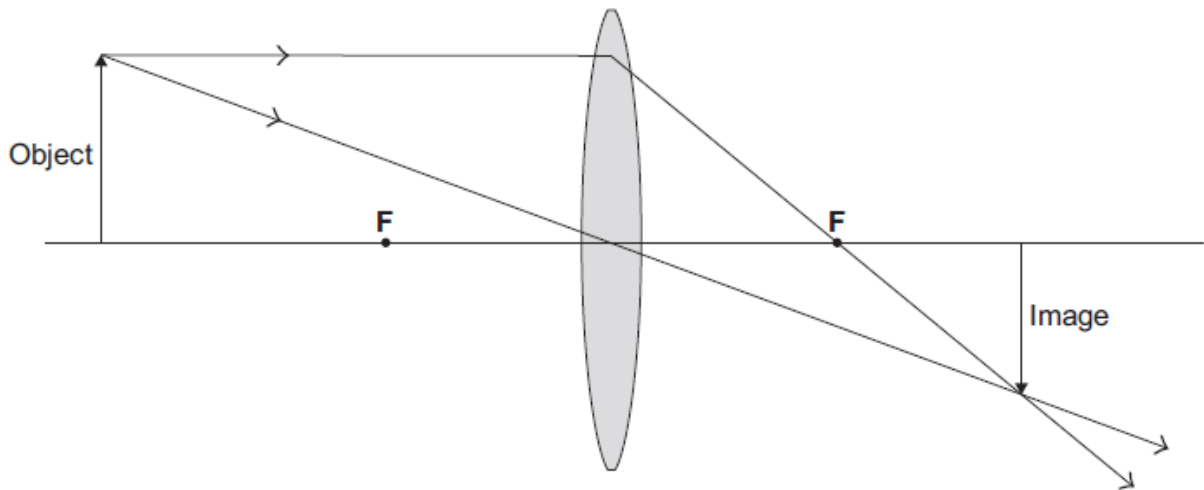
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(2 marks)

2.

The diagram shows a lens, the position of an object and the position of the image of the object.



(a) What type of lens is shown?

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(1 mark)

(b) What is the name of the points, **F**, shown each side of the lens?

.....
(1 mark)

(c) (i) The image is real and can be put on a screen.

How can you tell **from the diagram** that the image is real?

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.....
(1 mark)

(c) (ii) Draw a ring around a word in the box which describes the image produced by the lens.

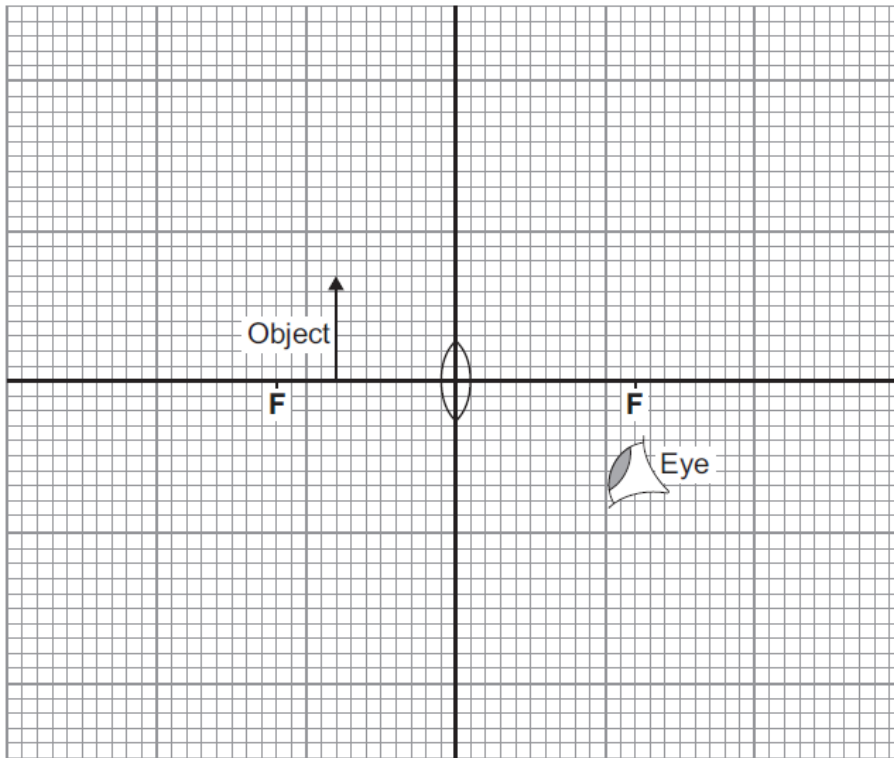
inverted	larger	upright
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(1 mark)

3.

(a) The diagram shows a converging lens being used as a magnifying glass.

(a) (i) On the diagram, use a ruler to draw two rays from the top of the object which show how and where the image is formed. Represent the image by an arrow drawn at the correct position.



(3 marks)

(a) (ii) Use the equation in the box to calculate the magnification produced by the lens.

$$\text{magnification} = \frac{\text{image height}}{\text{object height}}$$

Show clearly how you work out your answer.

.....
.....

Magnification =

(2 marks)

(b) A camera also uses a converging lens to form an image.

Describe how the image formed by the lens in a camera is different from the image formed by a lens used as a magnifying glass.

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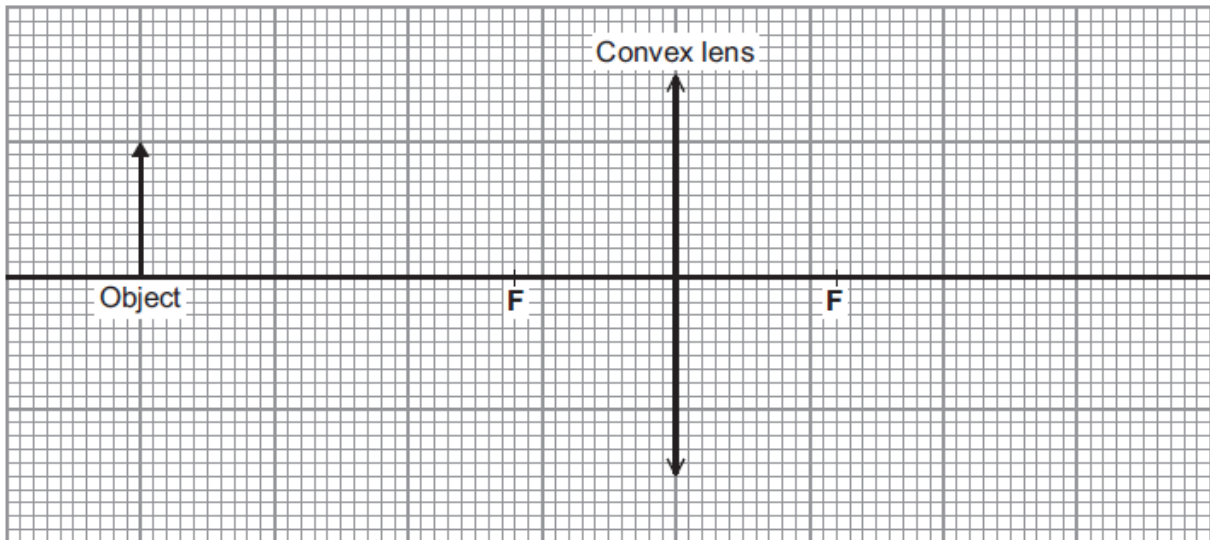
(2 marks)

4.

(a)

A camera was used to take photographs of the rafts. The camera contains a convex (converging) lens.

Complete the ray diagram to show how the lens produces an image of the object.



F = Principal focus

(4 marks)

(b)

State **two** words to describe the nature of the image produced by the lens in the camera.

1

2

(2 marks)

5.

- (a) Different shaped lenses are used to correct different types of eye defect.

The diagram shows the type of lens used to correct a defect called short-sight.

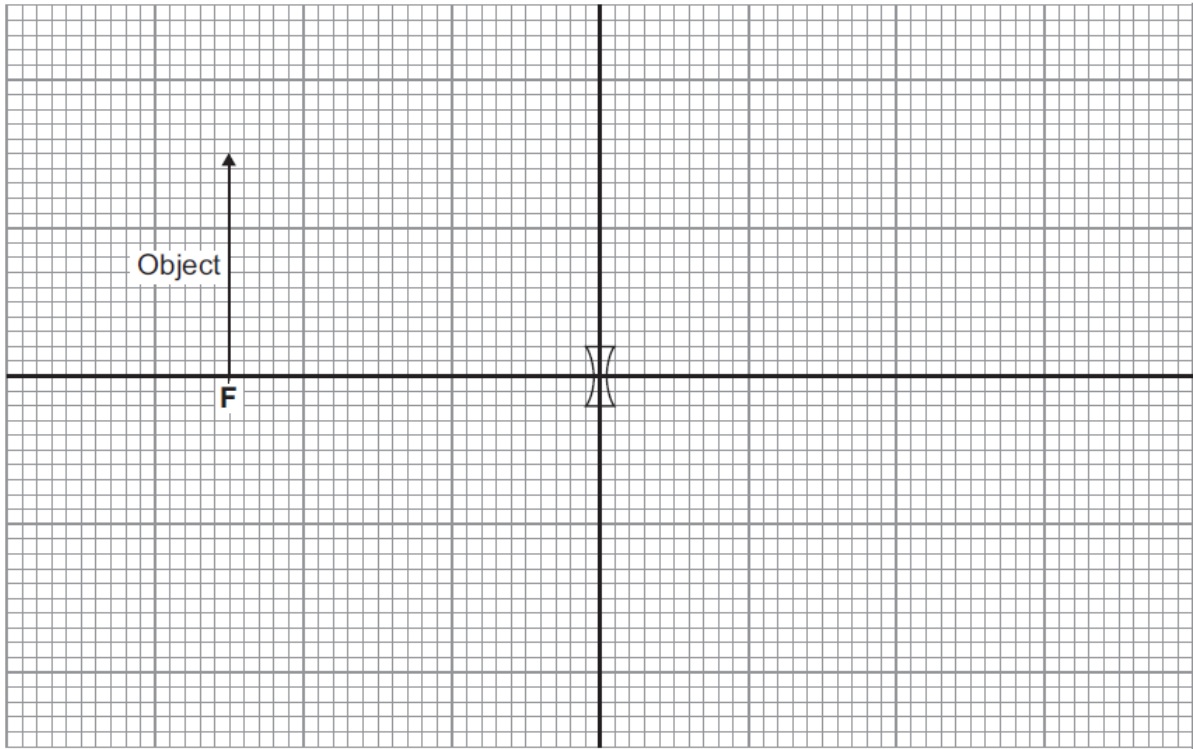


What name is given to a lens with this shape?

.....
(1 mark)

- (b) The diagram below shows the positions of an object and a lens. The lens is represented by a vertical line. Someone looking through the lens can see an image of the object.
- (b) (i) On the diagram, use a ruler to draw two rays from the top of the object, to show how and where the image is formed. Use an arrow to represent the image. The arrow should be drawn to the correct size and at the correct position.

(The diagram is on the next page)



(3 marks)

(b) (ii) Use the equation in the box to calculate the magnification produced by the lens.

$\text{magnification} = \frac{\text{image height}}{\text{object height}}$

Show clearly how you work out your answer.

.....

Magnification =

(2 marks)

(b) (iii) This type of lens always produces a virtual image.

How can you tell from the completed ray diagram that this image is virtual?

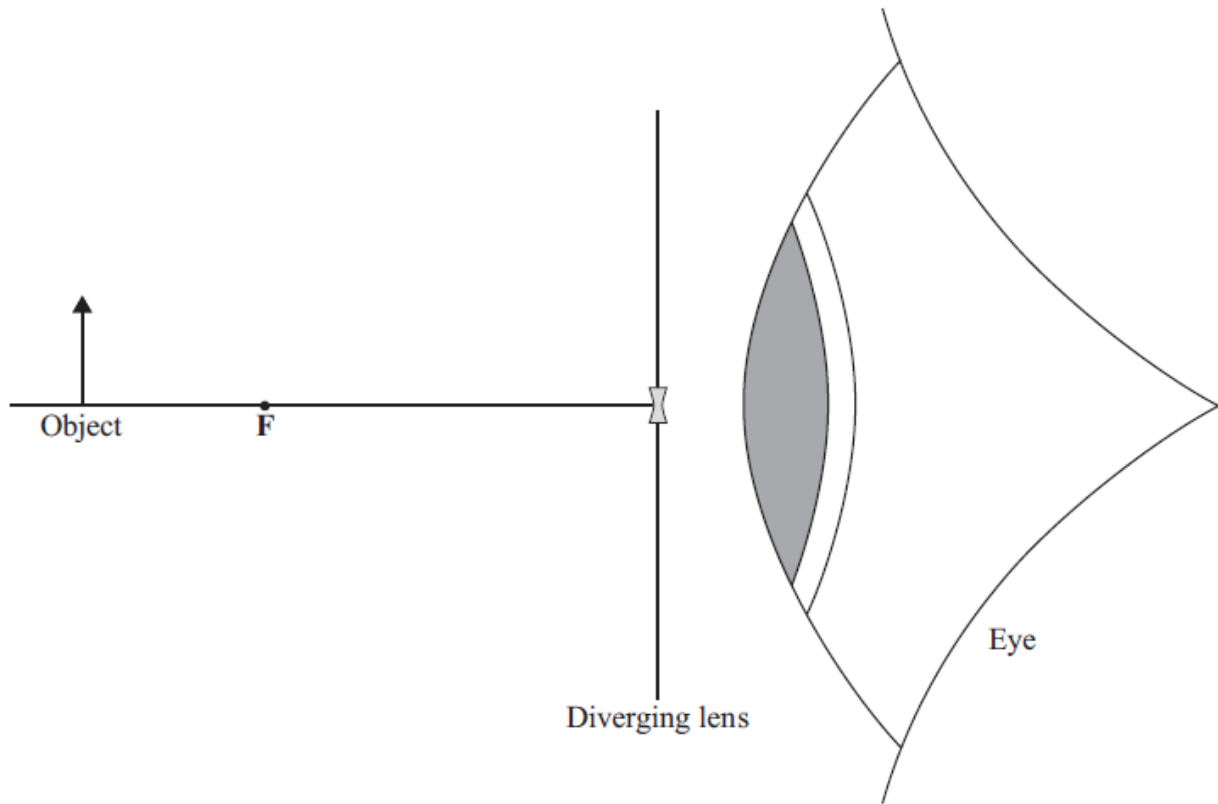
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(1 mark)

6.

The diagram shows an object located vertically on the principal axis of a diverging lens. A student looks through the lens and can see an image of the object.

- (a) Using a pencil and ruler to draw construction lines on the diagram, show how light from the object enters the student's eye and the size and position of the image.



(3 marks)

- (b) Describe the nature of the image by comparing it to the object.

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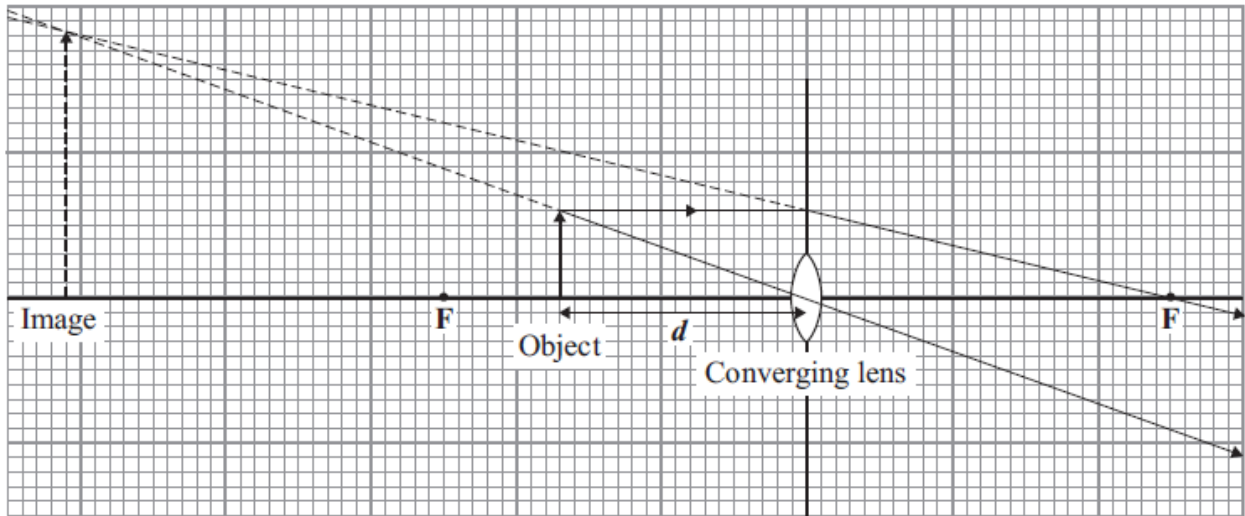
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(2 marks)

7.

A student investigates how the magnification of an object changes at different distances from a converging lens.

The diagram shows an object at distance d from a converging lens.



- (a) (i) The height of the object and the height of its image are drawn to scale.

Use the equation in the box to calculate the magnification produced by the lens shown in the diagram.

$\text{magnification} = \frac{\text{image height}}{\text{object height}}$

Show clearly how you work out your answer.

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Magnification =
(2 marks)

- (a) (ii) The points **F** are at equal distances on either side of the centre of the lens.

State the name of these points.

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(1 mark)

- (a) (iii) Explain how you can tell, **from the diagram**, that the image is virtual.

.....
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(1 mark)

- (b) The student now uses a different converging lens. He places the object between the lens and point **F** on the left.

The table shows the set of results that he gets for the distance d and for the magnification produced.

Distance d measured in cm	Magnification
5	1.2
10	1.5
15	2.0
20	3.0
25	6.0

His friend looks at the table and observes that when the distance doubles from 10 cm to 20 cm, the magnification doubles from 1.5 to 3.0.

His friend's conclusion is that:

The magnification is directly proportional to the distance of the object from the lens.

His friend's observation is correct but his friend's conclusion is **not** correct.

- (b) (i) Explain, with an example, why his friend's conclusion is **not** correct.

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(2 marks)

- (b) (ii) Write a correct conclusion.

.....
.....

(1 mark)

- (b) (iii) The maximum range of measurements for d is from the centre of the lens to **F** on the left.

The student **cannot** make a correct conclusion outside this range.

Explain why.

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(1 mark)

8.

Which diagram correctly shows rays passing through a camera lens?

